DOCUMENT RESUME

ED 376 282 CE 067 508

TITLE	Academic Integration Supplement to the Advanced Food Science and Nutrition Curriculum Guide.
INSTITUTION	Texas Tech Univ., Lubbock. Home Economics Curriculum Center.
SPONS AGENCY	Texas Education Agency, Austin. Dept. of Programs and Instruction.
PUB DATE	Jun 94
NOTE	39p.; For related documents, see ED 306 383 and ED 339 889.
AVAILABLE FROM	Home Economics Curriculum Center, Texas Tech University, Box 41161, Lubbock, TX 79409-1161.
PUB TYPE	Guides - Classroom Use - Teaching Guides (For Teacher) (052)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Behavioral Objectives; Career Exploration; Careers; Course Content; Course Descriptions; *Food Service; *Foods Instruction; Instructional Materials; *Integrated Curriculum; Language Arts; Mathematics Skills; *Nutrition Instruction; *Occupational Home Economics; Postsecondary Education; Science Instruction; Secondary Education; Social Studies; State Curriculum Guides; Units of Study

ABSTRACT

This supplement to an advanced food science and nutrition curriculum guide was developed for use in integrating academic principles with vocational home economics education in Texas. It contains learning and evaluation experiences specifically designed to integrate mathematics, science, language arts, and social studies principles within the advanced food science and nutrition course of study. The conceptual outline as shown in the left-hand column of the guide (with corresponding learning and evaluation experiences in the right-hand column) relates to the sub-element of each unit. In the right-hand column, "Key Question" identifies key points for content discussion and review; and "Critical Question" highlights methods of developing critical thinking skills. Thirteen teaching aids keyed to the learning and evaluation experiences are located at the end of the guide. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 376 282

Academic Integration Supplement to the Advanced Food Science and Nutrition Curriculum Guide

Developed and disseminated by:

HOME ECONOMICS CURRICULUM CENTER
Box 41161, Texas Tech University
Lubbock, Texas 79409-1161

Directed by:
Texas Tech University
College of Human Sciences
Lubbock, Texas

In Cooperation with:
Texas Education Agency
Department of Programs and Instruction
Division of Career and Technology Education
Home Economics Education
Austin, Texas

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

PERMISSION TO REPRODUCE THIS MATERIAL IN **OTHER THAN PAPER COPY** HAS BEEN GRANTED BY

M Whaley

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

June 1994

Guide to Use

This supplement is part of a series of materials published by the Home Economics Curriculum Center to facilitate integration of academic principles with home economics concepts. The supplement contains learning and evaluation experiences specifically designed to integrate mathematics, science, language arts, and social studies principles within the Advanced Food Science and Nutrition course of study. The suggested experiences have been written to satisfy the essential elements of the course, so a teacher desiring to integrate academic principles while meeting a particular essential element can readily identify and incorporate an appropriate activity.

The academic integration supplements comprise the final component in the series of *Academic Integration* materials. Having access to the first two publications in the series—*Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum* and *Integration of Social Studies Principles in the Home Economics Curriculum*—will greatly enhance effective use of the supplements.

Each of the publications are available from the Home Economics Curriculum Center, Texas Tech University, Box 41161, Lubbock, Texas 79409-1161.

Acknowledgements

The *Academic Integration Supplement to the Advanced Food Science and Nutrition Curriculum Guide* was prepared by the Home Economics Curriculum Center staff through a contract with the Texas Education Agency under the provisions of the Carl D. Perkins Vocational and Applied Technology Education Act (Public Law 101-392) in cooperation with the College of Human Sciences, Texas Tech University, Lubbock, Texas. The Home Economics Education unit of the Texas Education Agency provides supervision and directional guidance for curriculum development.

The following people made special contributions to the development of this publication:

Texas Education Agency Home Economics Education Staff:

Judith A. Hetherly
Program Director

Gay Nell McGinnis
Assistant Director

Cindy Gruner
Occupational Education Specialist

Sharon Pierce
Occupational Education Specialist

Home Economics Curriculum Center Staff:

Marilyn Wragg
Director

Connie Willems Dolarian, Information Specialist
Primary Writer

Gwen Adams, Information Specialist
Editor

Kelli LaBaume Childre, Information Specialist
Contributing Writer

Advisory and Review Committee:

Joan Barker
Madison High School
San Antonio, TX

Ann Pogue
South Grand Prairie High School
Grand Prairie, TX

Pat Carson
Avalon High School
Avalon, TX

Patti Rambo
Tahoka High School
Tahoka, TX

Shalon Inmon
Slaton High School
Slaton, TX

Melissa Beimer-Wade
Science Teacher
Smylie Wilson Jr. High School
Lubbock, TX

Sharon Kelley
Cooper High School
Abilene, TX

Lucy Walker
Amarillo ISD
Amarillo, TX

Wendy Petrzelka
Jefferson High School
El Paso, TX

Compliance Statement

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a nonsegregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act of 1964 is found, the findings are reported to the Office for Civil Rights, U.S. Department of Education.

If there is a direct violation of the Modified Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 22375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMI-NATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except when age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

ADVANCED FOOD SCIENCE AND NUTRITION

I. Significance of nutrition
A. Economic influence

Language Arts
Social Studies

Ask students to read pages 1-4 of the Reference Book. Display a transparency of Teaching Aid 1, Food Supply in Developing & Developed Countries. Ask students to recall what they read by providing information to enable you to fill in the blanks on the transparency. Explain to them that this is an exercise in graphing similarities and differences. After they have completed the graph, ask the students if graphing similarities and differences helped them understand the material they read in a different way. Have them explain why. Then ask students to suggest ways this method could be utilized to understand other areas of food and nutrition.

Social Studies

Review with students the information regarding basic economic principles found on pages 12-13 of *Integration of Social Studies Principles in the Home Economics Curriculum*. Lead students to discuss the fact that in a supply and demand economy, prices can be affected when consumers want more of a product than is available. For example, if an inadequate amount of corn was produced because of a drought, the price of corn might elevate. Provide for students newspaper articles that indicate agricultural areas where food production has been adversely affected by climate and natural disasters. Lead students to brainstorm the effects of such catastrophes on foods produced in these regions. As a follow-up, ask students to report food prices of items from affected areas to see if the reduced supply has increased the price of the items.

B. Nutrition and the prevention and treatment of health problems

Mathematics

Using table 2.1 found on page 14 of the Reference Book, ask students to create a menu for one day. The students must

- locate recipes to be utilized;
- figure the amounts of food each serving provides from the five food groups;
- add up the total number of servings to make sure that they represent what has been suggested by the pattern; and
- supplement the menus with food items that complete the suggested servings, for example, one glass of milk.

Ask the students to present their ideas to the class.

Language Arts

Instruct students to review the information regarding the *Dietary Guidelines for Americans* found on page 17 of the Reference Book. On the chalkboard or overhead projector write the titles of the seven guidelines. Lead students to brainstorm lists of diseases and health conditions that can result from not following each guideline. For example, the list under guideline two could include high blood pressure, heart disease, stroke, diabetes, and cancer. Ask students to follow up by creating cartoons that relate nutrition to good health

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	and the prevention of disease. Display the cartoons on a bulletin board.
C. Plan diets to meet special dietary needs	Ask students to locate copies of the Recommended Dietary Allowances (RDA). This resource is often located in nutrition textbooks. Have students do the following: • Compare nutrient needs of people from various age groups. (Nutrients might include protein; minerals, such as iron and calcium; and vitamins, such as vitamin A and vitamin C.) *Mathematics* • Plot on a graph the amount of nutrients required for infants; children; females and males in their early and late teens; pregnant and lactating females; females and males in adulthood; and females and males in late adulthood. Display the nutrient amounts on the vertical axis and the various groups on the horizontal axis. • Display graphs on a bulletin board entitled ,"Nutrient Needs and the Life Cycle."
	Write the term *nutrient density* on the chalkboard or overhead projector. Ask students to define the term. Lead students to discuss why pregnant women need to eat nutrient-dense foods. KEY QUESTIONS: If energy needs of a pregnant woman only increase about 15 percent, what happens if she consumes more calories than she needs? If nutrient needs rise during pregnancy, why is it important that a pregnant woman consume nutrient-dense foods? Why is it important that a woman consume foods rich in nutrients? What can result when she does not? Divide the class into seven groups. Assign each group one of the following nutrients: protein, folate, vitamin B_{12}, calcium, phosphorus, magnesium, and iron. Each group should *Science* • research the nutrient and find the amount required by a pregnant woman and problems associated with an inadequate intake of the nutrient; • suggest food sources high in the particular nutrient; and • present their information to the class. As students share the information, list on the chalkboard or overhead projector food sources high in each nutrient. Ask each student to create a menu for one day for a pregnant woman using the list and the Daily Food Guide for the Expectant Mother found on page 35 of the Reference Book.
D. Retaining nutrients in foods	Conduct the following demonstration to show that foods cut in smaller pieces lose nutrients more easily than those cut in larger pieces. *Science* Place half of a peeled potato in half a glass of water. Grate the other part of the potato and place the grated pieces in half a glass of water. Stir the contents of both glasses. Place five teaspoons of water from each glass into two different clean glasses. In each new glass place one drop of iodine. Tell students that iodine tests

for starch which is a form of carbohydrate. The darker the liquid, the more starch is contained.

Lead students to discuss nutrient loss through manipulation of food in the experiment. KEY QUESTIONS: What method best retains nutrients in food, chopping or grating? Why? Which solution indicates the presence of more starch? Why is more starch present? What method best retains nutrients? What can be implied from this experiment about manipulation procedures in food?

Ask students to read the information found on pages 42-43 of the Reference Book. Discuss the importance of retaining nutrients. KEY QUESTIONS: Why is it important to retain nutrients in foods? What can result when nutrients are not retained? What are some methods of preparation that preserve nutrients? Assign one of the five methods of nutrient retention listed on pages 42-43 of the Reference Book to each student. Have students pretend that they have created an invention that performs the functions of their assigned method. The invention can be real, as those described in the text, or imagined. Ask each student to do the following:

Language Arts

- Create a drawing of the invention that performs the method assigned.
- Create a brochure that introduces the invention to the market for the first time. (The brochure is intended to sell the idea to the public so it must be persuasive.)
- Include in the brochure how the invention works, why it preserves nutrients, and why nutrient preservation is important.
- Share brochures with the rest of the class.

E. Assess safety factors of food additives

Display a transparency of Teaching Aid 2, Artificial Sweeteners, and use the information to lead students to discuss how the U.S. Food and Drug Administration (FDA) performs its functions. KEY QUESTIONS: What is the GRAS (Generally Recognized as Safe) list? Does the FDA review substances that have been placed on the GRAS list? What happened to the prior approval of cyclamate? How did the public react to the ban on saccharin? Why? How did Congress respond to this reaction? Why do you think that the members of Congress changed the ban? What must products containing saccharin display? Do you think this labeling has any effect? Why does aspartame contain a warning label? Ask students to read over the bulleted list on page 54 of the Reference Book and evaluate which function applies to the information given regarding artificial sweeteners.

Science
Social Studies

Display a transparency of Teaching Aid 3, The Acceptance of Additive X. Lead the students to decide the fate of additive X. Review with students the information bulleted on the Teaching Aid. Then lead students through the flow chart by asking them to provide reasons for yes or no answers. Conclude by asking students to

Language Arts

summarize the information on page 50 of the Reference Book that discusses how the FDA regulates food additives in the nation's food supply. Lead the students to discuss the steps the agency takes to approve an additive. KEY QUESTIONS: Who submits test results to the FDA? What type of hearing is conducted regarding additives? Why do you think it is public? CRITICAL QUESTIONS: What type of information would you think is discussed at the hearing? What types of questions do you recommend asking during the hearing for a new additive? Why?

F. World food supply

Have students read the information on page 63 of the Reference Book regarding how climate affects the world food supply. Then review for them the information regarding various climate and vegetation patterns of the world found on pages 80-81 of *Integration of Social Studies Principles in the Home Economics Curriculum.* Ask students to form six groups. Assign each group a type of climate to research. Make sure they complete the following:

Language Arts
Social Studies

- Give examples of countries, types of crops grown, traditional food items produced from the crops, status of nutritional health of the population, and examples of weather pattern changes that have an effect on the food supply.
- Consolidate this information into a report with a display of staple foods, examples of recipes, pictures of the people and conditions, and a display of areas on a map.
- Present the report to the class.

Invite an agricultural extension agent to discuss methods currently used to increase the world food supply. The agent should concentrate on ways that have been developed to increase crop yields per acre and new nutrient-rich crops being used in cultivated areas. In addition, ask the agent to give examples, and discuss the overall effect technology can have on the food supply. Ask students to prepare a list of questions prior to the agent's visit. Instruct students to take notes and follow up the discussion with a written account in the form of a newspaper article that could be published in the school newspaper.

Language Arts

G. International organizations for improved nutrition

Have students define the term *preamble.* Ask them to describe why a newly formed organization would write a preamble. Review with the students information regarding the Food and Agriculture Organization (FAO) found on page 70 of the Reference Book. Have them pay close attention to the preamble found in figure 7.1. Ask students to pretend they are at a meeting of the FAO in which the preamble is being established. Lead students to discuss what they might add to or delete from the preamble if they had input. KEY QUESTIONS: Do the bulleted purposes on the preamble fit the needs of the organization as discussed in the Reference Book? Why? What purposes should be added? Why? What purposes

Language Arts
Social Studies

should be deleted? Why? CRITICAL QUESTION: What world conditions have changed since 1945 when the preamble was ratified that might lead members of the organization to create a different preamble today?

Social Studies

Invite a social studies teacher to provide information regarding the United Nations (UN). Ask the teacher to discuss how specialized agencies of the UN, such as the Food and Agriculture Organization, the International Fund for Agricultural Development, and the World Health Organization, help to promote world peace and better living conditions for the world population. Provide for the teacher figures 7.1 and 7.2 in the Reference Book, and ask the teacher to use these figures as points of reference for the discussion.

H. Nutrition and world progress

Mathematics

Use figure 7.4 on page 75 of the Reference Book to create a mathematics exercise that will enable students to understand the statistics stated in the figure in a variety of ways. Ask students to perform the following calculations:

- Review the bulleted items and deduce how they might represent these various statistics using such things as percentages, ratios, or graphs and charts. (For example, students might calculate the percentage of the total number of people who die from hunger that are children. Tell students to find this percentage by dividing 60,000 into 40,000 and then multiplying the answer by 100.)
- Use the same method to find what percentage of the world's poorest countries export food to North America.
- Display on a circle graph the statistics regarding Africa's population, and landless laborers.
- Create a bar graph with the average life expectancy at birth of Southern Africans as compared with North Americans (around seventy years), South Americans (around sixty-seven years), and Asians (around sixty-three years).

Point out to students how mathematics concepts related to graphs and percentages are used in this activity. CRITICAL QUESTION: How can the ability to display and understand statistics in various forms be a helpful method of communication.

Social Studies

Ask students to locate newspaper articles about countries currently being supplied foreign aid by the United States. Ask students to read the articles as a class and locate the countries on a map or globe. Write the phrase *international foreign policy* on the chalkboard or overhead projector. Ask students to define its meaning and describe the implications of the phrase. KEY QUESTIONS: Why might the security and economic well-being of the United States be closely tied to the security, stability, and prosperity of other nations? Why would the idea of international foreign policy be based on this belief? What benefits does the United States receive from being involved in foreign aid? How might providing such aid affect the

security of the United States? Display a transparency of Teaching Aid 4, Cyclical Flow of Foreign Aid, and use it to lead a discussion about the effects of foreign aid on the economy. KEY QUESTIONS: Is foreign aid only a drain on the economy, or can there be economic benefits as well? How might providing foreign aid monies affect the U.S. economy? What might these countries purchase from America? How would these purchases affect the U.S. economy?

II. Food processing and marketing

A. Scientific and creative aspects

Lead students to discuss food fabrication. KEY QUESTIONS: What are fabricated foods? What are some examples of fabricated foods? What examples are discussed on pages 82-83 of the Reference Book? What are reasons people might use fabricated foods? Explain to students that some reasons are religious or financial. Ask students to describe why using texturized vegetable protein to extend meat might be economical. Point out that they have probably eaten this protein in hot dogs and hamburgers. Plan a laboratory experience for students comparing a recipe made with meat with the same recipe prepared with texturized vegetable protein as a meat substitute or meat extender. Ask students to estimate the cost per serving of both items. Lead students to discuss their findings. KEY QUESTIONS: What is the difference in price between the two items? Why is there a difference? What implications could the use of texturized vegetable protein have on a family budget? What other recipes might be adapted to use texturized vegetable protein?

Mathematics

Display examples of various packages used to promote the same type of food product, including a generic counterpart. Instruct each student to list messages portrayed to the consumer by each label. Choose one product that has what you perceive as an effective package. Display this product along with the generic form of the same product. Display a transparency of Teaching Aid 5, The Package Says It All. Lead students to brainstorm the differences and similarities between the communication presented on each label. Write the differences in the corresponding outside circle and the similarities in the overlapping middle area. After this exercise ask students to

- formulate sentences using the brainstormed ideas,
- consider the idea that not all of the characteristics are the same, and
- volunteer some of their best sentences.

Write some of the sentences next to the spaces marked by bullets on the Teaching Aid. CRITICAL QUESTION: Why does marketing of a product involve the labeling of the package?

Language Arts

B. Safety and sanitation

Lead students to brainstorm functions of packaging. Ideas include the following:

- aids in sales through catching the attention of the consumer

- displays information required by the government
- conveys instructions for use
- displays cautions and warnings
- keeps item sanitary
- reduces theft
- limits access by children
- inhibits product tampering

Review with students the information regarding the HACCP System found in figure 9.2 on page 97 of the Reference Book. Ask them to pay careful attention to category three. Ask students ways that they can tell they are buying food products with which no tampering has occurred. Lead students to brainstorm the difference between tamper-resistant and tamper-evident packaging. Display food items with packaging that demonstrates both tamper-resistant and tamper-evident features. Examples include plastic bands, films, pull tabs, and pop top lids. Lead the students to discuss how industry has responded to safety concerns of consumers. KEY QUESTIONS: Should industry include such features on food products? Why? Do you think that the average consumer looks for such features? Why? Do you think the average consumer would buy one brand over another because of a feature that indicates tampering? Why? Review with students the rights and responsibilities of consumers found on page 15 of *Integration of Social Studies Principles in the Home Economics Curriculum.* Conclude by asking students to describe the rights and responsibilities of consumers related to the packaging features discussed.

Social Studies

Instruct students to examine a variety of food items that have been canned. Students should notice the seals on the package as well as the list of ingredients. Ask students to decide why canning stops the growth of bacteria. Distribute to each student a copy of Teaching Aid 6, Food Preservation is Affected by Environment. Review with students the instructions for the experiment. This experiment can be done as a demonstration or in several labs. Conduct the experiment. Follow up by asking students to infer reasons for inclusion of some of the substances used in the experiment in food processing. Have each group record the information in a lab report format.

Science

C. Assess methods for processing foods

Instruct students to review information on page 41 of the Reference Book regarding alkalinity and acidity. Then ask them to read information regarding canning found on page 104 of the Reference Book. Reinforce these concepts with information regarding acids, bases, and salts found on page 56 of *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum.* Instruct students to

Mathematics
Science

- create a line graph depicting pH levels of common foods found in table 10.1 on page 104 of the Reference Book;
- label on the line graph the point at which clostridium botulinum

spores will not grow; and
- label the range of numbers that indicate acidity, the point of neutrality, and the range of numbers indicating alkalinity.

Lead students to discuss the results. KEY QUESTIONS: What does a low number indicate? What does a high number indicate? What do you think is indicated by a substance being on either end of the scale? As a laboratory experiment, have students prepare test tubes with solutions like tap water, lemon juice, milk, vinegar, apple juice, coffee, orange juice, and egg whites. Have students perform the following experiment:

1. Dip pH indicator paper into each solution. (The indicator paper and color scale may be obtained from the science department.)
2. Compare the resulting color to a scale that indicates pH values.
3. Record results, telling if the substance was acidic, basic, or alkaline.

Lead students to discuss findings. CRITICAL QUESTION: What is the importance of knowing pH levels when canning food?

Language Arts

Read to students information regarding fact and opinion, grounded and ungrounded belief, and rational thought and rationalization found on page 92 of *Integration of Mathematics, Science, and Language Arts Principles*. List the terms *fact, opinion, grounded belief, ungrounded belief, rational thought*, and *rationalization* on the chalkboard or overhead projector. Ask students to read the text regarding irradiation on page 106-107 of the Reference Book and pull out or create statements that are examples of the list of terms on the chalkboard or overhead. For example, the statement "Irradiation is a method of preserving food by exposing the food to ionizing radiation" is a fact. After students have completed this exercise, ask them to relate other ideas about foods that are examples of the six terms. CRITICAL QUESTIONS: How could an ungrounded belief that is prevalent in society negatively affect the food industry? What are some steps that could be taken to combat such an ungrounded belief?

D. Impact of processing

Mathematics

Ask students to analyze table 11.1 on page 114 of the Reference Book. Ask them to figure the percentage of nutrient retained in some foods after processing compared to their original nutrient content. For example, peas retain only 30 percent of their original vitamin C value when going from the raw state to canned. Ask students to calculate percent retained by dividing the reduced amount by the original content. Emphasize that there is an increase in nutrients between milk containing 3.5 percent fat and buttermilk containing .1 percent fat. Ask them to analyze the reason for such an increase. Lead students to consider that by reducing the fat content, the remaining fluid is more concentrated and therefore contains more concentrated amounts of the nutrients.

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
Social Studies	Ask students to research the history of food preservation. Have them cover the following: • Discuss how and why early methods were used. • Discuss modern food preservation. (Inventors to investigate include Lazzaro Spallanzani, Nicolas Appert, John Gorrie, and Clarence Birdseye. Methods of preservation include drying, curing, fermentation, salting, canning, cold storage, and freezing.) • Create a bulletin board display with drawings of inventors or equipment used in processing along with labels from food items that have been processed using the various methods researched. • Create captions explaining the pictures. Lead the students to create a time line depicting the dates of the major inventions.
E. Chemical reactions of food processing *Science*	Write the word *bioavailable* on the chalkboard or overhead projector. Ask students to interpret its meaning as it relates to nutrient absorption. Have them break down the word to its roots. Remind them that bio relates to all that is living. Ask them to read table 11.3 on page 117 of the Reference Book. Have them select the factor listed that describes the term *bioavailability*. Display a transparency of Teaching Aid 7, Chemical Reactions and Nutrient Availability. Review with the students the definitions, making sure that students defined bioavailability accurately. Go over the examples of binders and nutrients and foods that aid absorption. Lead students to discuss the examples. KEY QUESTIONS: What processing methods make minerals more available in grain products? Why? Why might societies who rely on unleavened bread as a staple have a zinc deficiency? CRITICAL QUESTION: How can the information regarding binders and nutrients and foods that aid absorption be related to dietary guideline number one of figure 2.2 on page 17 of the Reference Book?
Language Arts *Science*	Write the words *acidity, oxygen, temperature*, and *water* across the chalkboard or overhead projector. Lead students to brainstorm examples of foods whose microbial growth is inhibited by each factor, and list below the word. For example, pickled foods represent the factor *acidity*. Ask them to cross reference this list with the information on table 11.2 to determine if they have been accurate in their suggestions. Have them complete the following open-ended sentences to determine a cause and effect relationship between chemical reactions in foods and food preservation: • The chemical reaction caused by acidity is used in food preservation because . . . • The chemical reaction caused by presence of oxygen in foods is dealt with through such measures as canning because . . . • The chemical reaction caused by food being placed in temperatures between 60°F and 120°F is avoided in food preservation because . . .

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	• The chemical reaction of binding water is used in food preservation because . . .
III. Food science and products A. Quality of food products	Write the word *muckraker* on the chalkboard or overhead projector, and ask students to define the word. Share the following information with students: Theodore Roosevelt called a group of writers in the early 1900s by the name muckrakers. The writings of these individuals uncovered social and political corruption of the time. The topics included prostitution, child labor, and corruption in government and business. Review for students the purposes of writing found on pages 83-84 of *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum.* Discuss persuasive writing. KEY QUESTIONS: What type of writing did the muckrakers use? Why? How might their writings have led to public interest in legislation to establish laws? Read excerpts from *The Jungle* (1906) written by Upton Sinclair. Share the following information with students: The book, *The Jungle*, describes the deplorable conditions of the Chicago meat-packing industry at the turn of the century. The release of this book helped to lead to the passage of America's first pure food laws. Theodore Roosevelt read the novel and ordered an investigation. The report that came back prompted him to push reform by Congress. Have students read information about the food laws on page 122 of the Reference Book and speculate on what laws were most impacted by Sinclair's book. Explain that the laws most affected were the Pure Food and Drug Act and the Meat Inspection Act. CRITICAL QUESTIONS: What is the effect Sinclair had on American political history? What media do the muckrakers of today utilize for social comment? Why?
Language Arts *Social Studies*	
	Review with students information regarding agencies that oversee food quality and wholesomeness found on pages 124-126 of the Reference Book. Divide the class into seven groups. Assign each group one of the first seven agencies listed under the assigned section in the Reference Book. Ask each group to list the safety hazards with which each agency is concerned. Then instruct students to pretend that their group heads the agency they were assigned. Have them develop and write a plan for eliminating safety hazards for their agency. Have the groups share their ideas with the rest of the class.
Language Arts	

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
B. Effect of ingredients on food products	Lead students to brainstorm reasons consumers purchase various forms of the same types of foods and examples of foods that can be found in a variety of forms. Ask students to • read various food advertisements to compare the cost of various forms of foods (For example, students could locate and compare the price per serving of raw, canned, or dehydrated apples.); • locate food composition tables that provide information based on commonly used portions; and • find cost per serving by dividing the cost of the amount purchased. (For example, divide cost per pound by the number of servings in that quantity.) Lead students to discuss their findings. KEY QUESTIONS: What method resulted in the highest cost per serving? Why? What method resulted in the lowest cost per serving? Why? Is there enough of a difference between the costs to persuade consumers to purchase the food in a form that may take up more storage space or that is not the preferred form?
Mathematics	
	Instruct each lab to freeze a different type of food in a standard freezer. This food should have a quick-frozen counterpart that can be purchased at the grocery store for comparison of the two freezing methods. After the students' samples have been adequately frozen, have students defrost the samples to compare with the defrosted quick-frozen product. Lead them to compare the products for such things as color, texture, and dehydration. Discuss the results. KEY QUESTIONS: Which product best maintained color? Which product best maintained structure? Which product lost the greatest amount of water? Which method produced the best over all quality? Why might someone use a slow-freeze method? Share the following information with students:
Science	Quick-freezing of food produces better quality results than slow-freezing methods. Foods frozen at home are usually slow-frozen. When foods are slow-frozen their cellular structure changes in a way that when the food is defrosted the foods release fluids. This release of fluids changes the texture of the food; vegetables can become mushy and meat can become tough. Spoilage is more likely to occur when the slow-freezing method is used because the food may be in a temperature range that allows microorganisms to grow. CRITICAL QUESTION: Freon used in the fastest method of freezing foods can cause damage to the atmosphere. Why might some companies continue to use the process?
C. Effect of manipulative procedures on food products	Display a transparency of Teaching Aid 6, The Composing Process, found in *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum.* Review the information and tell students that they are going to utilize the method in creating a demonstration for the class. Divide the class
Language Arts	

into five groups. Assign each group a method of hand mixing found on pages 152-153 of the Reference Book. Have the groups

- prepare a demonstration of a recipe using the assigned method;
- create a written script that involves all the members of the group; and
- include in the script information regarding the type of recipes that utilize the method and why the method is utilized in the recipe.

Science

Before discussing gluten, have students complete a laboratory experiment to make gluten balls. Distribute a handout of Teaching Aid 8, The Hidden Substance, to each student. Provide necessary supplies so students can follow the directions and answer the questions on the handout. Lead students to discuss their answers. Follow up by asking students to compare and contrast their conclusions with the information regarding gluten found on pages 151-152 of the Reference Book.

D. Effect of cooking utensils on food products

Instruct students to read information about measuring utensils found on page 165 of the Reference Book. Ask them to estimate the amount of difference there might be between measuring water or flour using the wrong type of measuring cup. Ask students to conduct the following experiments:

- Measure one cup of water in a liquid measuring cup, making sure to read the amount of water at eye level and at the meniscus. Measure one cup of water in a dry measuring cup. Pour the amounts of each cup into identical clear drinking glasses. Look at the amounts at eye level to determine the difference between the contents of both glasses.
- Measure one cup of flour in a dry measuring cup, making sure to level off the excess. Measure one cup of flour in a liquid measuring cup. Pour the amounts of each cup into identical clear drinking glasses. Look at the amounts at eye level to determine the difference between the contents of both glasses.

Mathematics

- Determine the difference in accuracy of measurement when using various spoons. Measure salt or sugar with different flatware "tablespoons," making sure to level off the excess. Pour the amounts in separate labeled piles on waxed paper, and then measure them again using a measuring tablespoon.

Lead students to discuss the results of the experiments. KEY QUESTIONS: Was there any difference in the amounts of water? Why? What difference would it make to add too much or too little liquid to recipes? Was there any difference in amounts of flour? Why? What difference would it make to the results of recipes to add an inaccurate amount of flour? Was there any difference in amounts of salt or sugar? Why? What difference could measuring an inaccurate amount of salt or sugar make on a recipe? What are the implications of measuring inaccurately?

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	Tell the following story to students: Carrie was an active healthy toddler who freely crawled around the old house her parents were renovating. As she grew older, she delighted at dinner time because she was fed every meal from a brightly-colored pottery bowl her mother bought at an antique store. As she grew she seemed to have more and more difficulty walking and keeping her balance. When she went to school she had a hard time hearing what the teacher said and seemed to have trouble paying attention. She often was lethargic and had bouts with diarrhea. Ask the students to decide what might have been the source of Carrie's problems. Display a transparency of Teaching Aid 9, Lead: Problems and Sources. Use it to review with students the hazards of lead. Point out that lead can affect food products and people who consume these products when the metal leaches out of utensils and dishes.
Science	
E. Effect of temperature on food products	Remind students that there are two common scales by which temperature is measured—Celsius and Fahrenheit. In the United States, the Fahrenheit temperature scale is used most often. Ask them to describe instances when it might be important to know how to convert from one scale to another. Distribute a copy of Teaching Aid 10, Celsius and Fahrenheit. Have students research the point at which water freezes and boils on both the Celsius and Fahrenheit scales. Have them fill in these points on the handout. Ask them to answer question #1 on the handout. Lead them to consider the fact that there are 100°C between the freezing point and boiling point of water on the Celsius scale. Contrast this with the 180°F between these two points on the Fahrenheit scale. Assist students in changing Celsius to Fahrenheit and Fahrenheit to Celsius by using the formulas on the handout. Check students' answers. If students are having trouble, explain the concept again, and assign more practice problems.
Mathematics *Science*	
	Ask students to read information regarding stir-frying found on page 175 of the Reference Book. NOTE: Displaying a wok may be helpful in the discussion regarding its characteristics. Tell students that the word *Wok* is a Cantonese term that means "cooking vessel." Ask them to conclude about the wok's shape given the following information: • The wood-burning ranges used in kitchens in China had an opening at the top. • The wok was developed by people who had difficulty buying or finding fuel for cooking. The wok was heated with just a small number of burning twigs at the base. • When stir frying in a wok, food should be cut into small, uniform pieces, evenly coated with oil, and turned often. Ask students to research Chinese cuisine and locate various stir-fry
Social Studies	

recipes. Follow up by asking students to prepare a Chinese stir-fry dish. Remind them that the food must be cut in small, uniform pieces.

F. Effect of leavening agents on food products

Review with students the information regarding the three activities of cells found on page 42 of *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum*. Have them define the term *fermentation*. Ask students to describe why leavening with yeast is considered a fermentation process. Tell students that fermentation occurs as the yeast converts sugar into ethyl alcohol and carbon dioxide. Write the following on the chalkboard:

Yeast

sugar ➡ ethyl alcohol and carbon dioxide

Ask students to decide what happens to the ethyl alcohol, the carbon dioxide, and the yeast given the fact that one substance causes the product to rise, another substance evaporates, and the other substance dies. Instruct students to read information regarding yeast found on pages 194-195 of the Reference Book. Tell students that they will be conducting an experiment to demonstrate the importance of proper environment for yeast growth. Provide for each laboratory five empty, clean carbonated beverage bottles or glass milk bottles, active dry yeast, sugar, salt, water, a thermometer, and balloons. Have them perform an experiment using the following variables:

Science

- 1 tablespoon yeast and 1/2 cup of water between 78°F and 85°F
- 1 tablespoon yeast, 1 teaspoon sugar, and 1/2 cup of water at the same temperature
- 1 tablespoon yeast, 1 teaspoon salt, and 1/2 cup of water at the same temperature
- 1 tablespoon yeast, 1 teaspoon sugar, and 1/2 cup of cold water well below 78°F
- 1 tablespoon yeast, 1 teaspoon sugar, and 1/2 cup of water at least 140°F

Have students combine the mixtures in each variable and cover the top of the bottles with balloons. Ask students to notice what happens to the balloons and describe what these results indicate. Lead students to discuss the effect of sugar, salt, and temperature on the formation of yeast. KEY QUESTIONS: What does the sugar do for yeast? What happens if yeast is in too cool an environment? What happens if yeast is in too hot an environment? What happens when yeast is in too salty an environment? Follow up by having students carefully handle yeast while making yeast bread.

Social Studies

Ask students to describe why bread has been called the *staff of life*. Lead students to consider that bread is a food found in almost every culture on earth and that it provides a great deal of energy to the diet of most people. Share the following information with students:

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	Before leavened bread was discovered, people made flat bread from grain meal and water and baked the dough on heated rocks. Egyptians may have been the first to discover yeast bread about 2600 B.C. Perhaps this happened when yeast spores drifted onto dough that had been set out before baking or when ale was used as a liquid in dough. The Egyptians taught bread making to the Greeks who later taught the Romans. The Romans taught the Europeans, and by the Middle Ages bread making was common in Europe. Assign each student or group of students a country to research. Have them • use their text or library resources to find information regarding common breads and grains used in their country; • locate a recipe for the bread; and • present their findings as the class makes a list of countries, breads, and grains. Choose several of the recipes, and have individual labs make each bread. Ask students to compare the results for appearance, appeal, and flavor.
G. Principles of protein, vitamin, and carbohydrate cookery	Divide the class into laboratory groups. Assign each group a type of bean. Give each group forty beans and the following instructions: • Figure the volume of the beans by using water displacement. Measure 4 oz. of water in a liquid measuring cup or 40 ml. of water in a graduated cylinder. • Place the beans in the water, and record the level of water displaced by the beans. • Subtract the original amount of the water from the displaced amount to get the volume of the beans. • Record that amount. • Place the beans in enough water to cover and soak overnight. • The next day, drain the beans and allow them to dry on a towel. • Measure 4 oz. of water in the same liquid measuring cup or 40 ml. of water in the same graduated cylinder. • Place the beans in the water, and record the level of water displaced by the beans. • Subtract the original amount of water from the displaced amount to get the volume of the beans. • Record the amount.
Mathematics	Review with students information regarding ratio and percent found on page 15 of *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum.* Explain to students that they will be figuring ratio and percent using the findings of their experiment. Students can figure these numbers using the following formulas: • To figure the ratio, place the volume of the beans before soaking to the left of the colon and the volume of the beans after soaking to the right of the colon.

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	• To figure the percentage of the volume of beans before soaking as compared to after soaking, divide the volume before soaking by the volume after soaking. Then multiply that number by 100. Ask students to deduce the importance of accurately measuring the amount of dry beans for recipes.
Social Studies	Ask students to speculate on the origins of pasta. Tell them that it is not certain where the food originated, but that Marco Polo discovered that both China and Italy had similar products upon journeying to China during the thirteenth century. Display various pastas originating from China and from Italy. Ask students to read the labels to discover the contents of each type. Use the ideas to discuss the concept of cultural geography found on page 83 of *Integration of Social Studies Principles in the Home Economics Curriculum.* KEY QUESTIONS: What are the similarities in the pastas? Why? What are the differences? Why? Knowing that the origin of pasta may have come from China and Italy simultaneously, what can we understand about the people of these cultures? What might it help us appreciate about the people of these cultures?
H. Factors affecting fat absorption in frying	Duplicate two to three copies of Teaching Aids 11a and 11b, The Fat Game. Cut the Teaching Aid into enough pieces that each student can be matched to a partner. There may be one or more students who have the same information on their square. Distribute one square to each student. Explain to students that they are in either the "Fat Absorption Depends Upon" category or in the "Because" category. Their job is to locate the individual who has the counterpart to the information on their square. Have students choose the person with the information that best matches the information on their square. When all partners have been located, go over the information as a class.
Language Arts	
Science	Instruct laboratories of students to determine the melting point of fat by performing the following experiment: • Clip a thermometer to a pan of cold water. • Place a glob of fat into the water. • Heat the water slowly, and watch the fat sample closely to observe the melting point. • Record the temperature at which the fat began to melt. • Discard the contents of the pan and begin again with another sample. Have students continue by testing the melting point of fats, such as margarine, butter, lard, and hydrogenated vegetable shortening. Lead students to compare their results.
I. Making food products more nutritious	Instruct students to read about *nutrient density* and *empty calories* on pages 235-236 of the Reference Book. Have them close the book and describe to a partner the meanings of the two terms. Share the

following with students:

The nutrient density of one food can be compared to the nutrient density of another food by performing a mathematical calculation. The calculation involves dividing the amount of a particular nutrient contributed by a food item by the amount of food energy or calories that food item provides. The higher the number, the more nutrient-dense the food.

Have students determine which food is more nutrient dense in calcium: cheddar cheese or nonfat milk. Explain that 1 1/2 oz. of cheddar cheese has about 300 mg. of calcium, and 8 oz. of nonfat milk has about 300 mg. of calcium. Have students determine which food is more nutrient dense by

Mathematics

- dividing 300 by 86 (the number of calories in an 8 ounce serving of nonfat milk); and
- dividing 300 by 170 (the number of calories in a 1 1/2 ounce serving of cheddar cheese).

Ask students to determine which food item is more nutrient dense. Ask them to decide why the cheddar cheese is higher in calories than the nonfat milk and relate this fact to nutrient density. Continue by having students compare the nutrient density of various foods using the same calculation.

Write the terms *hard water* and *soft water* on the chalkboard or overhead projector. Ask students to describe the differences between the two types of water. After students have made attempts at defining the differences, distribute a handout of Teaching Aid 12, Distillation of Water, to each student. Students can contact the local water company and request a composition breakdown of the local water. Ask students to conduct the experiment. Follow up the experiment by leading the students to discuss the findings. KEY QUESTIONS: What minerals are left behind? Can they be harmful? Why are they in water? Tell students that hard water contains magnesium or calcium ions. These metal ions are not present in soft water. Hard water can

Science

- affect the tenderness of foods like lentils and beans,
- make beverages cloudy,
- cause a residue of gray film on clothes, and
- cause spots on dishes.

Present pamphlets from various products used to change hard water into soft water. Lead students to assess the advantages and disadvantages of using these systems.

IV. Food and nutrition technology

A. New forms and sources of foods

Instruct students to pretend that they have gone back in time 100 years and have been asked to explain new foods and sources of foods. Have students research their topic and write a description of what they might tell someone of that time about any of the following:

Science

- food in space

- food from the ocean
- food grown hydroponically

Have students present the information to the class.

Mathematics

Instruct students to read about vending machines found on page 255 of the Reference Book. Ask students to create a survey to determine the frequency with which students use vending machines. Have them do this by

- deciding various frequency amounts like more than once a day, once a day, once a week, once a month;
- creating a form for use by the entire class;
- determining the amount of students to be surveyed by class members; and
- surveying students on campus.

Tally the results on the chalkboard or overhead projector. Percentages could be derived from the statistics. Ask students to write a written report about the findings and draw conclusions about the results. For example, they might suggest reasons for frequencies. Have students share their results with the rest of the class.

B. Research in nutrition and food science

Language Arts
Science

Ask students to use Teaching Aid 13, Lab Report Format, to record descriptions of tests that have been reported in scientific nutrition journals. Instruct them to

- report on a topic that interests them;
- summarize the information in a journal report;
- present the summary to the class;
- include visual aids; and
- recreate the experiment if this seems appropriate.

Language Arts

Ask students to locate current articles in magazines and newspapers about the controversy surrounding the use of animals in research. Each student should present the main points of the article to the class. Ask students to read information regarding animal and human studies found on pages 265-266 of the Reference Book. Lead students to list the advantages and disadvantages of using animals in research,

C. Effect of technology on food and nutrition

Science

Take students on a field trip to a genetics engineering lab so they can observe the kinds of research being done to engineer fruits and vegetables that stay fresh longer, provide more vitamins and minerals, and require less treatment for insect resistance and disease. If this is not possible, invite an engineer from the lab to class to discuss new technologies. Have students view films of how food is harvested before it is ripe so that it can be shipped to the marketplace and arrive fresh. KEY QUESTIONS: What are the advantages and disadvantages of such a system? How can food be transported to stores more quickly to eliminate harvesting before it is ripe? Lead students to discuss harvest time on various foods. KEY

CONCEPTS	LEARNING AND EVALUATION EXPERIENCES
	QUESTIONS: Which kinds of foods can be picked fully ripe and maintain quality in the market? Which foods are significantly affected by the point at which they are picked?
Mathematics	Ask students to look at table 23.2 found on page 278 of the Reference Book. Lead students to compare and contrast the information on each pie graph. KEY QUESTIONS: Why do you think the farm value, processing, wholesaling, and transportation percentages of the chart on the right are less than the chart on the left? If a farmer received the same amount of money for a product that was eventually sold through the two systems represented on the chart, which system sold the product for a higher price? Why? Why do you think food service takes up such a large percentage of the pie on the right?
D. Dissemination and using reliable nutritional information	Point out that soil erosion is a serious threat to solving world hunger. Ask students to describe reasons why soil erosion poses such a threat. Ask students to research information regarding the Dust Bowl that occurred in the United States during the 1930s, making sure to answer the following questions: • Why was the Dust Bowl considered such a huge environmental disaster? • Where did this disaster occur? • How many acres were endangered? • What human factor lead to the Dust Bowl? • Summarize the effects of the Dust Bowl • What aid was provided by the federal government? View the video "The Grapes of Wrath" or read excerpts from the book written in 1939 by John Steinbeck. Ask students to describe the effects of the Dust Bowl upon the people represented in the story. CRITICAL QUESTION: Why might this novel be considered one of the most powerful books of social protest in the history of American literature?
Science *Social Studies*	
Language Arts	Invite a guest speaker from one of the organizations listed on page 294 of the Reference Book. Ask students to prepare questions in advance to ask the speaker. Topics could include the origins of the organization, the mission of the organization, why the organization is interested in providing information regarding nutrition, how the organization provides such information, and examples of materials created by the organization. Ask students to follow up the discussion by creating a promotional flyer for the organization.

FOOD SUPPLY in Developing & Developed Countries

Developing Countries — Developed Countries

HOW ALIKE

1. _____
2. _____
3. _____

HOW DIFFERENT

Adequacy of Food Supply

4. _____ 5. _____

Dietary Mainstay

6. _____ 7. _____

How Grain is Consumed

8. _____ 9. _____

Dietary Problems

10. _____ 11. _____

Adapted from: *Organizing Thinking*, © 1990, Critical Thinking Press & Software, P.O. Box 448, Pacific Grove, CA 93950, (800) 458-4849

ARTIFICIAL Sweeteners

Cyclamate

Cyclamate was approved for use by the FDA in the early 1950s. It quickly became a popular sugar substitute used in a variety of products, including toothpaste, cereal, and canned and baked goods. In 1969 the FDA banned the use of cyclamate because laboratory tests showed it caused bladder tumors in laboratory rats fed large amounts of the sweetener. At the present time approval of cyclamate is again being sought from the FDA.

Saccharin

Saccharin has been around since before the turn of the century. It is used most often in soft drinks. In 1977, Saccharin was removed from the Generally Recognized as Safe (GRAS) list by the FDA because testing showed that large amounts in repeated dosages could cause bladder tumors in laboratory rats. Because saccharin was such a popular artificial sweetener, Congress passed special legislation and imposed a moratorium on the ban. Since that time congress has extended the moratorium several times. By law, those products containing saccharine are required to carry a label that warns consumers that saccharine may be hazardous to their health.

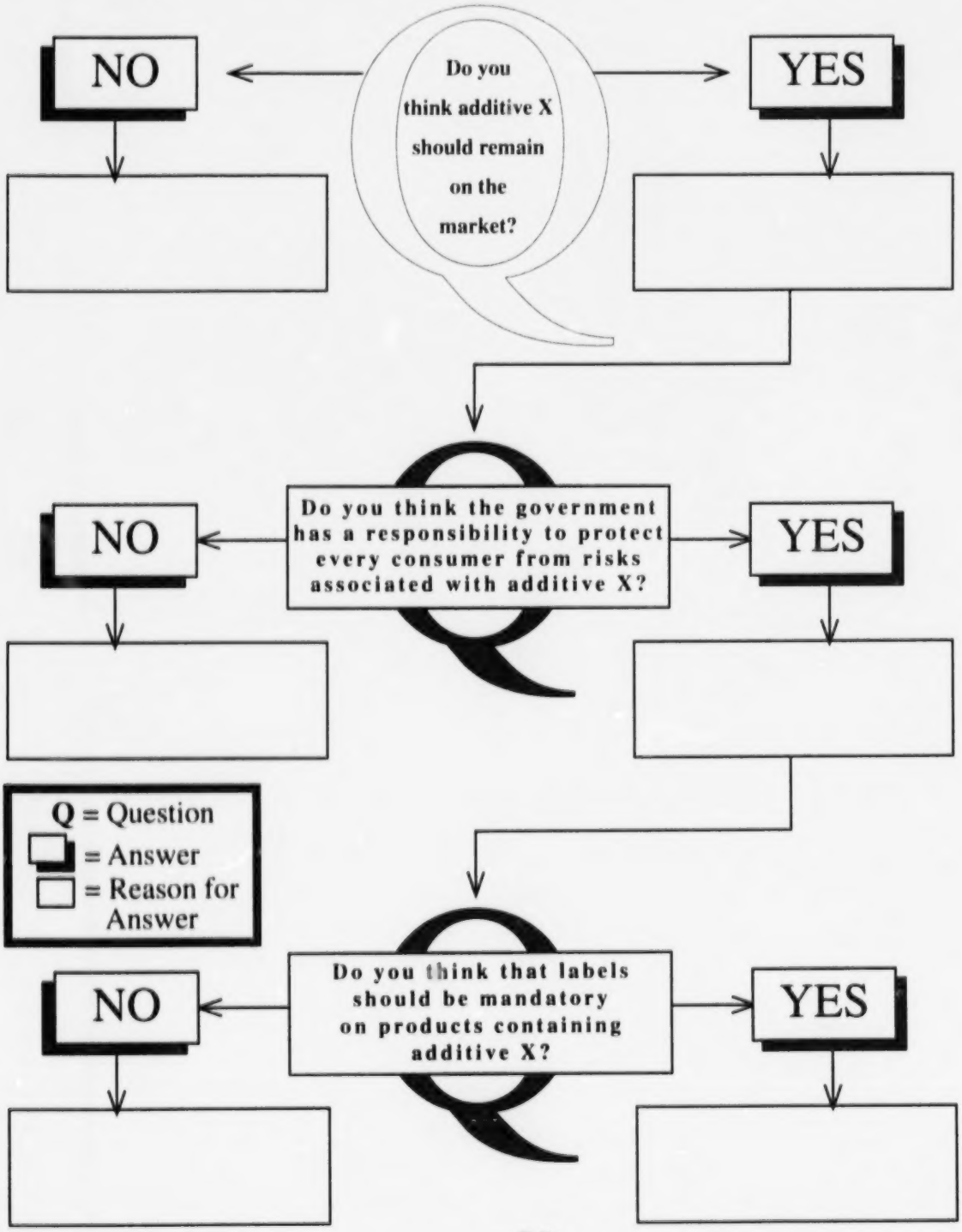
Aspartame

Aspartame was approved by the FDA in 1981. It is marketed under the name NutraSweet®. It consists of two amino acids, phenylalanine and aspartic acid. The FDA set guidelines for the acceptable daily intake of the artificial sweetener. Most people consume much less of the substance per day than has been approved. Because aspartame can cause problems for certain individuals, products containing the substance must carry a warning label. People with a disease called phenylketonuria (PKU) are unable to get rid of some of the phenylalanine left over when the body breaks down aspartame. This residual accumulates in the body and can produce toxic effects. Children with PKU may suffer neurologic damage from the substance.

The Acceptance of Additive X

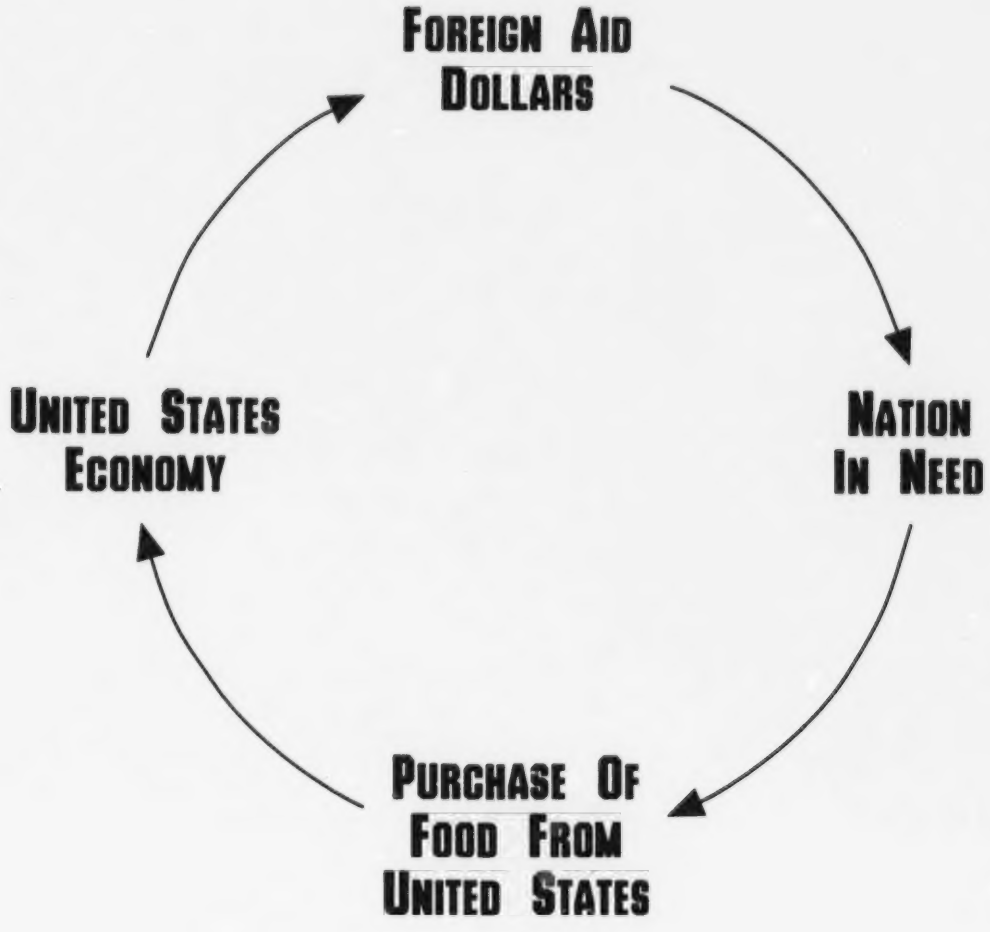
Should this product be banned?

- may cause tumors in lab animals when given in large doses over a long period of time.
- some people say it gives them headaches—unsubstantiated by scientific evidence.
- some people with a specific disease are allergic to the substance.

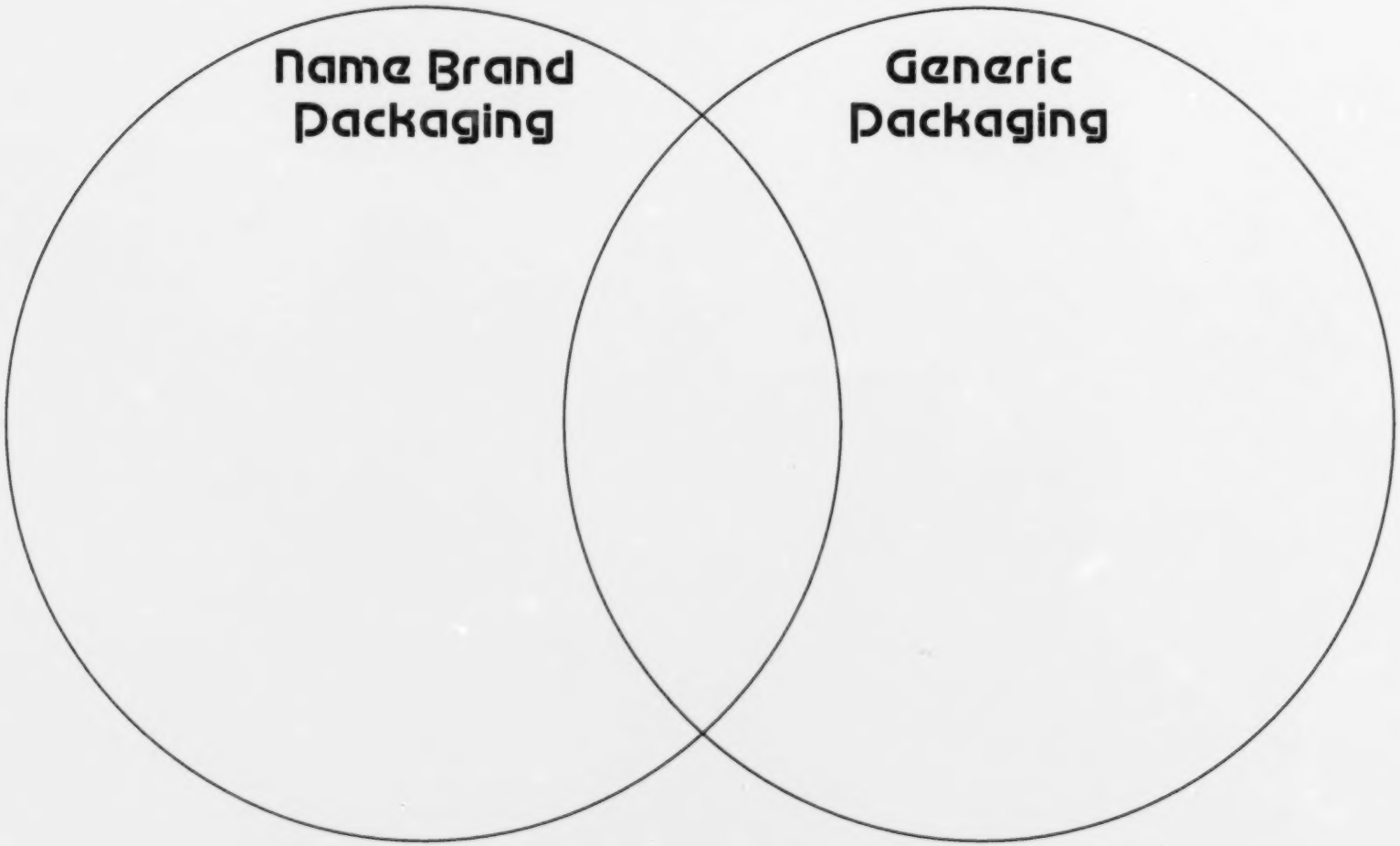

NO
Do you think additive X should remain on the market?
YES
NO
Do you think the government has a responsibility to protect every consumer from risks associated with additive X?
YES
Q = Question
= Answer
= Reason for Answer
NO
Do you think that labels should be mandatory on products containing additive X?
YES

TA 4

CYCLICAL FLOW OF FOREIGN AID



The Package Says It All



- _____
- _____

- _____
- _____

TA 5

Food Preservation is Affected by Environment

PURPOSE

In canning, as well as in other methods of food preservation, steps are taken to stop the growth of bacteria so food can be stored without spoiling. There are a number of factors that determine whether a given environment will promote the growth of microorganisms. This experiment will illustrate some of the factors that have an impact on bacterial growth.

PROCEDURE

1. Obtain 200 ml. chicken broth, and put it in a 250 ml. beaker.
2. Heat the broth-filled beaker on a medium-high setting. Boil the broth for five minutes. Remove the broth from the heat, and cool for at least five minutes or until the beaker is cool enough to handle safely.
3. Fill a large saucepan with tap water. Bring the water to a boil.
4. Place six empty 50 ml. beakers in the boiling water for five minutes to sterilize. Remove each beaker with tongs, drain, and cool.
5. Fill each of the beakers one-half full of chicken broth.
6. Use masking tape to label the beakers A, B, C, D, E, and F. Also label with your name and class period.
7. Add the following substances to the specified beakers and stir. Use a clean stirring rod in each beaker.
   - Beaker A—add 5 ml. sugar
   - Beaker B—add 2.5 ml. salt
   - Beaker C—add 5 ml. salt
   - Beaker D—add 5 ml. water
   - Beaker E—add 5 ml. lemon juice
   - Beaker F—add nothing
8. Place the beakers in the area indicated by your teacher.
9. On the sixth day, observe each beaker sample for color, general appearance, and odor. Do not taste the broth. Record your observations in your data table.
10. If any mold has appeared on your broth, use tweezers to transfer a small sample of the mold from the beaker to a microscope slide. Try not to crush the mold as you transfer it. Examine the mold under a microscope. Include drawings of the appearance of the mold in your laboratory report.

QUESTIONS

1. Which sample differed most from the others?
2. Which samples were most similar in their properties?
3. Which beakers contained mold? Why do you suppose mold grew in those beakers and not the others?
4. How do you think your results would have differed if you had refrigerated the samples?

SAMPLE DATA TABLE

Beaker	Color	Appearance	Odor
A			
B			
C			
D			
E			
F			

Adapted with permissions from *Food Science and You, Teacher's Resource Guide* by Kay Mehas and Sharon Rodgers. Copyright © 1994 by the Glencoe Division of the MacMillan/McGraw Hill School Publishing Company.

CHEMICAL REACTIONS AND NUTRIENT AVAILABILITY

- ***Chemical changes*** produce one or more new substances.
- A ***compound*** is a pure substance made up of two or more chemically combined atoms. All molecules in a compound are the same.
- ***Bioavailability*** refers to how easy a particular nutrient can be absorbed into the body. In some foods, nutrients are bound to other chemical compounds. This makes them unavailable for use by the body.
- ***Binders*** are chemical compounds in foods that may combine with nutrients to form substances that cannot be absorbed by the body.

Examples of Binders

- Phytic acid found in legumes and grains make calcium, iron, and zinc less available.
- Oxalic acid found in rhubarb and spinach can bind calcium and iron.
- When large amounts of zinc are present in the body, copper absorption may decrease.

Examples of Nutrients and Foods that Aid Absorption

- When iron is consumed with vitamin C, absorption of the mineral greatly improves.
- Calcium absorption is improved by the vitamin D hormone calcitriol.
- Mineral absorption in grains increases when yeast is used to leaven the grain product. This is because the enzymes produced by the yeast break down the substance created when phytic acid combines with minerals.

The Hidden Substance

1. **Measure one-half cup (1/2 cup) of flour.**
2. **Add two tablespoons (2 T.) water and mix with a fork until a stiff dough is formed.**
3. **If some of the flour is still dry, gradually add one more tablespoon (1 T.) of water and mix.**
4. **Let mixture stand for five minutes.**
5. **Knead dough about ten minutes. Lab partners may trade off this duty.**
6. **Place dough in large bowl. Add cold water.**
7. **Knead the dough under the water.**
8. **Change the water by pouring the contents of the bowl into a strainer.**
9. **Continue to knead the dough in changes of cold water until rinse water remains clear.**

Answer the following questions at the completion of the experiment:

1. *What do you think the substance is that resulted from the experiment?*

2. *What are the properties of the material?*

3. *What do you think happens to dough that is kneaded to make bread?*

4. *Why?*

5. *Why is kneading necessary?*

LEAD: Problems and Sources

Problems:

Lead is a dangerous mineral. When it is absorbed in the body it impairs growth, and health. It is a metal that the body cannot destroy. It takes the place of metals required by the body to function properly. These metals include iron, calcium, and zinc. The results of ingestion of lead include kidney disease, anemia, and damage to the nervous system.

Sources:

Pottery. Pottery glazes can contain lead. Although these glazes are not allowed to be used on commercially produced pottery in the United States, they might still exist in antique pottery, homemade pottery, or pottery produced outside of the United States. It is important to know where pottery comes from and when it was made. Other things that can reduce risk are not storing acidic foods or beverages in ceramic containers and not warming coffee in cups with ceramic glazes.

Galvanized or other metal containers, except stainless steel. Never store acidic products in metal containers unless they are stainless steel. Lead can leach into the food product because the acid it contains dissolves the metal.

Lead Crystal. Some people use leaded crystal decanters to store alcohol. Other people use crystal baby bottles to feed their children. Lead can leach out of crystal containers into liquids such as wine, spirits, juice, and formula.

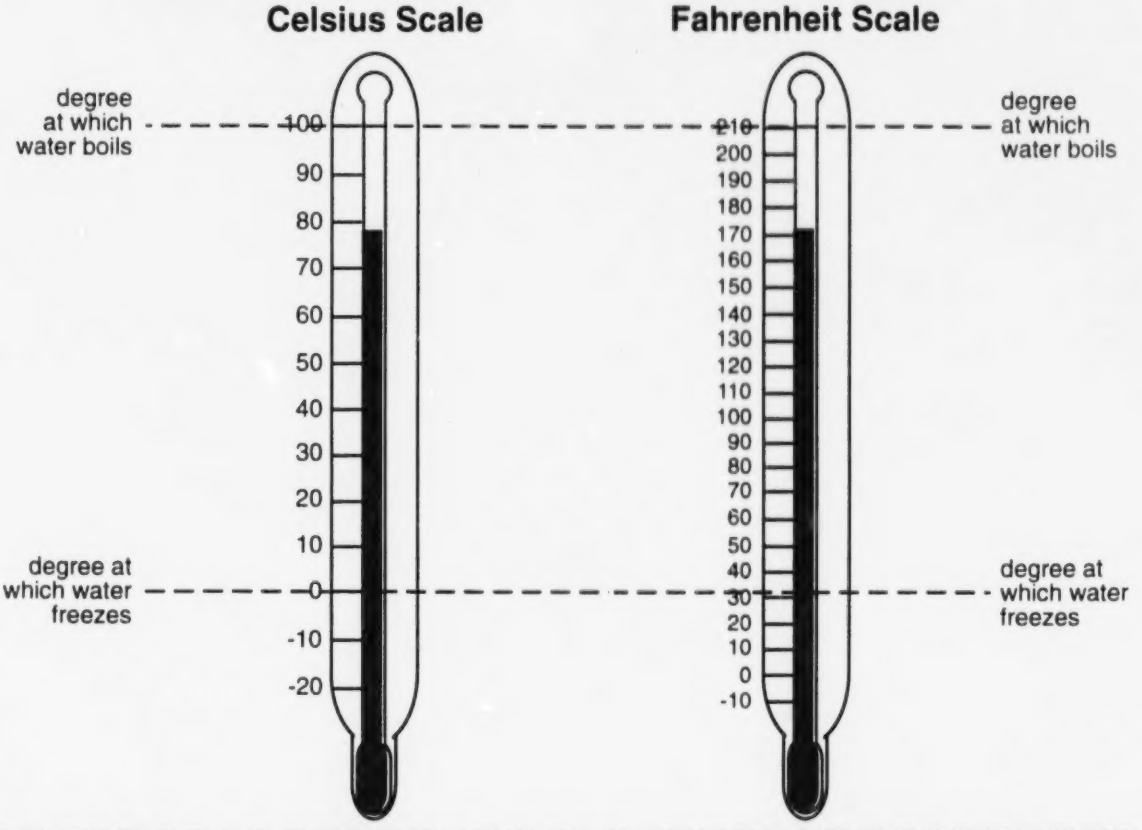
Lead Solder. Lead solder joints in cans begin to release lead after they have been exposed to air. Quickly remove any food from open cans and store it in another container.

Recycled Bread Bags. When turning a bread bag inside out, the lead-based paint from the labels can come off onto any food stored in it.

Water from pipes. Solder joints in copper pipes can leach lead. Let tap water run a few minutes before using it. Don't use hot tap water for cooking because the elevated temperature allows lead to leach into the water more easily.

Lead-based Paints. Old lead-based paints can be consumed by curious toddlers who may ingest it unknowingly. Lead poisoning all too often poses a serious environmental threat to children.

Celsius and Fahrenheit



1. Why does a degree on the Celsius scale mark more of a temperature change than a degree on the Fahrenheit scale?

2. For problems a through c, change Celsius to Fahrenheit using the following formula: **°F = 9/5(°C – 32)**

   a. Change 35°C to °F.

   b. Change 72°C to °F.

   c. Change 90°C to °F.

3. For problems d through f, change Fahrenheit to Celsius using the following formula: **°C = 5/9(°F – 32)**

   a. Change 27°F to °C.

   b. Change 110°F to °C.

   c. Change 185°F to °C.

The FAT Game

FAT ABSORPTION DEPENDS UPON. . . . Quality and condition of the fat	BECAUSE. . . . Decomposing fat will not maintain the necessary temperature.
FAT ABSORPTION DEPENDS UPON. . . . Amount of surface area exposed on the food	BECAUSE. . . . The more surface area exposed to fat, the more fat is absorbed.
FAT ABSORPTION DEPENDS UPON. . . . Composition and type of food	BECAUSE. . . . Foods with high sugar content, flours with high gluten content, and watery foods absorb more fat.
FAT ABSORPTION DEPENDS UPON. . . . Length of cooking time	BECAUSE. . . . The longer food is in the fat, the more fat will be absorbed.
FAT ABSORPTION DEPENDS UPON. . . . Temperature of the fat	BECAUSE. . . . If the temperature of the fat is too low, the cooking time must be longer. The longer the food is in the fat, the more fat will be absorbed.

The FAT Game (continued)

FAT ABSORPTION DEPENDS UPON. . . . The ratio of food to fat	BECAUSE. . . . If the ratio of food to fat is too great, the temperature of the fat will lower, and the food will have to stay in the fat longer to be done.
FAT ABSORPTION DEPENDS UPON. . . . Whether the product is raw or cooked	BECAUSE. . . . Raw foods require longer cooking times and must stay in the fat longer, thus absorbing more fat.
FAT ABSORPTION DEPENDS UPON. . . . The temperature of the product before frying	BECAUSE. . . . Frozen, chilled, or refrigerated foods will take longer to cook than foods at room temperature; therefore, they will be in the fat longer and absorb more fat.
FAT ABSORPTION DEPENDS UPON. . . .	BECAUSE. . . .
FAT ABSORPTION DEPENDS UPON. . . .	BECAUSE. . . .

Distillation of Water

Directions: Follow the steps in completing the experiment, then record your findings.

1. Measure 50 ml. of hard water and place it in beaker 1.
2. Measure 50 ml. of soft water and place it in a beaker 2.
3. One at a time, evaporate water from each beaker by placing above a Bunsen burner. (Be cautious in handling burners and beakers.)

Record the findings:

a. Which beaker left more residue?

b. What does the residue look like?

c. Explain why there is residue.

d. What do you think is contained in the residue? Why?

Lab Report Format

Pretend that you conducted the experiment described in the article. Record your methodology and conclusions using the following format:

I. Purpose
- * Why are you conducting the experiment?
- * What is your hypothesis for the lab?
- * What do you expect to find?

II. Materials
- * What do you need to conduct the experiment?

III. Procedure
- * What are the step-by-step directions for your experiment?

IV. Data/Observations
- * Results (Depicted in charts or graphs)
- * Written observations of what occurred in the experiment

V. Conclusions
- * What did you learn?
- * What can you conclude from the results?
- * Did you prove your hypothesis?
- * Why?
- * How can you relate this information to daily life?